

NORTH PACIFIC OCEAN

By WILLIS E. HURD

Atmospheric pressure.—During March, 1931, atmospheric pressure rose generally over that of February throughout the Aleutian region, the Gulf of Alaska, and along the greater part of the American coast and adjacent waters. The Aleutian cyclone remained central on the average, as in the preceding month, over and near the Peninsula of Alaska, with average pressure of 29.65 inches at Kodiak, where a rise of 0.42 inch occurred over the February mean.

The North Pacific anticyclone was in general less well developed than in February, owing to the more frequent intrusion upon its central area by cyclones from higher latitudes. In the main, however, it remained stable over a considerable region off the coast of the United States and in lower middle latitudes, and thence westward into east longitudes.

The following table gives barometric data for several island and coast stations in west longitudes, including Point Barrow on the Arctic Ocean.

TABLE 1.—Averages, departures, and extremes of atmospheric pressure at sea level, at indicated hours, North Pacific Ocean and adjacent waters, March, 1931

Stations	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Inches	Inch	Inches		Inches	
Point Barrow ¹	30.50	+0.35	30.90	12th ²	30.10	24th.
Dutch Harbor ¹	29.76	+0.06	30.32	10th	28.94	3d.
St. Paul ¹	29.81	+0.06	30.40	11th	29.22	4th.
Kodiak	29.65	-0.04	30.30	9th	28.80	21st.
Midway Island ¹	30.00	-0.07	30.34	21st	29.62	27th.
Honolulu ¹	30.06	+0.02	30.15	3d	29.94	29th.
Juneau ¹	29.98	+0.02	30.51	6th	29.17	20th.
Tatoosh Island ¹	30.08	+0.08	30.53	22d	29.47	11th.
San Francisco ¹	30.13	+0.08	30.37	2d	29.79	4th.
San Diego ¹	30.02	0.00	30.26	1st	29.74	25th.

¹ P. m. observations only in averages; a. m. and p. m. in extremes.

² And on the 13th.

³ For 30 days.

⁴ A. m. and p. m. observations.

⁵ Corrected to 24-hour mean.

Cyclones and gales.—Cyclonic activity was less intense and gales as a consequence were less frequent over that half of the ocean east of 180° longitude than in February. In this region few winds were reported of higher force than 9. Of the exceptions, one was a south gale of force 11 experienced by the S. S. *Golden Sun* southwest of the Gulf of Alaska on the 3d, while the vessel was on the eastern edge of an Aleutian disturbance then centered about 5° south of Dutch Harbor. Another was an east gale of force 10 experienced by the S. S. *Admiral Farragut* in the upper waters of the Gulf of Alaska on the 23d, in connection with a cyclone then central over the eastern part of the Bering Sea.

Going westward from middle longitudes, however, seamen entered a zone of greatly increased storminess and, along the upper routes, of lessened visibility, especially during the early half of the month. From the central Aleutians southward to about 25° or 30° north latitude, and thence westward to the Kuril Islands and Japan, an area is inclosed over which more and severer gales occurred during the first 18 days of March than were experienced during the entire preceding month. After the 18th, storminess was scattered and relatively infrequent.

Along the western extent of the northern steamship routes storm to hurricane velocities were reported on the 2d, 4th, 5th, and 6th between 45° and 50° N., and 165° E. and 180°, in connection with the severest storm field of the month. The disturbance in this region, during the period of greatest intensification, was augmented by two Lows, one from Siberia, the other from China. The latter left the continent on the 2d and after skirting the east coast of Japan lay east of the Kurils on the 5th. After the 6th the major storm seems to have abated in energy, since from the 7th to the 10th of March no winds exceeding force 10 were reported from its general field. The American S. S. *Bellingham*, westbound between Tacoma and Yokohama, passed through this storm, encountering heavy gales with snow from the 3d, when near 50° N., 165° E., until the 9th, when near 44° N., 156° E. On the 6th the ship was reported as "one mass of ice" from snow and sleet, and on the 7th as hove to on account of gales and thickness of the weather. An offshoot from this storm seems early to have gone eastward and southeastward as a moderate cyclone until the 9th, on which date it was central near 39° N., 142° W. Later it moved northeastward and entered the coast of British Columbia on the 12th.

On the 9th a Low developed east of Taiwan and proceeded northeastward. By the afternoon of the 12th it had acquired sufficient energy east of northern Japan so that the S. S. *Bellingham*, closely following its recent experience with blinding snow squalls, underwent further stiff weather which culminated in a northwesterly gale of force 11 southeast of Yezo. During the 12th to 14th, connected with the storm development, as it covered a widening field, gales of force 8 to 10 occurred over a considerable expanse of water between latitudes 25° and 40° N. and extending as far east as the one hundred and seventy-fifth meridian of east longitude.

On the 18th, in 39° N., 146° E., the S. S. *President Taft* encountered gales which reached a maximum force of 11 from westnorthwest. The heaviest forces occurred during a rapid rise in pressure following the passage of a moderate disturbance.

Off the central California coast local gales, rising at times to force 9, were reported on the 4th, 5th, and 24th. These were produced by the strong gradients existing between neighboring inland depressions and the eastern ridges of the North Pacific high abutting on the coast.

In the Gulf of Tehuantepec strong northers, maximum force 10, were encountered on the 8th to 10th, during the prevalence of an anticyclone over the southern part of the United States and the Gulf of Mexico.

Winds at Honolulu.—At Honolulu the prevailing wind this March was from the east, but kona winds occurred during 25 per cent of the hours, being unusually frequent for the month. The maximum velocity was 26 miles an hour from the northeast on the 31st. The average hourly velocity was 6.7 miles, which, according to the Honolulu record, is the lowest for the month since the opening of the station in 1904.

Fog and smoke.—There was very little change in the low frequency and scattered formation of fog over most of the ocean over that of the preceding February, the percentage of days with the phenomenon, as reported, not exceeding 10 for the most frequented areas to the westward of the one hundred and thirtieth meridian of west longitude. Along the California coast, however,

fog showed a decided increase in frequency, with a maximum occurrence on about 40 per cent of the days over the region within approximately 100 miles of San Francisco.

On several days of the month, particularly on the 8th and 9th and the 18th to 24th, vessels reported smoke from burning brush which somewhat impeded navigation close on the coasts of Guatemala and Salvador. This most generally prevailed in the early morning, being carried inland by the sea breeze about 8:30 a. m.

THE FIJI ISLANDS STORM OF FEBRUARY 17-MARCH 2, 1931

By WILLIS E. HURD

In an official report dated March 10, 1931, to the Secretary of State, the American consul at Suva, Fiji, Quincy F. Roberts, begins thus:

The Fiji Islands, during the period February 17 to March 2, 1931, experienced a hurricane and floods said to be the worst in the history of the colony.

Unfortunately there are not yet exact data at hand from which to determine whether one or two cyclones hovered about the islands during this period, although it was not until the 3d of March that westerly winds arrived at Suva, near the southeastern extremity of the largest island, which indicated by the circulation that the center was receding southward. According to newspaper reports, two hurricanes devastated the islands, one about the 21st and 22d of February and the other on the 1st and 2d of March. These are the four days on which, during 14 days of stormy weather with periods of abnormally heavy rainfall, the meteorological conditions were apparently most violent. The destruction to property, including buildings and cattle, and to such crops as breadfruits and sugarcane, as well as the loss of approximately 200 lives, was probably confined to the principal island, Viti Levu. Most of the loss of life was by drowning in the extraordinary floods produced on the eastern slopes of the island, where many villages were wholly destroyed.

While the gales did not exceed force 9 at Suva, according to the consular report, yet hurricane velocities occurred in various districts, especially in the north and west, where the cyclonic force seems to have centered, and also at sea. In some localities both east and west of the principal mountain range the flood stages in the rivers were the highest of record. The heaviest rainfall reported occurred at Nandarivatu, on the western slope of the range, near Mount Victoria, where 84 inches fell in less than a week. The heavy precipitation occurred to the east of the storm center and quite apparently in the forward left-hand quadrant, as the cyclone seemingly moved southwestward during the occurrence of most of these excessive rains.

The lowest barometer reading reported was 28.70 inches, occurring at Lautoka, on the northwest of Viti Levu, at midnight of the 21st. Shipping was much hampered by the heavy seas, the high winds, and the thick weather, which prevented a landing. The steamship *Golden Harvest* occupied 15 days in making the trip of 1,500 miles between Brisbane and Fiji, and the steamship *Malake* spent three days during the 21st to 24th in steaming the 50 or 60 miles between the Fijian ports of Levuka and Suva, harbor lights being obscured by the blinding rain, and the ship also being driven off her course by the terrific winds and seas.

BUCKET OBSERVATIONS OF SEA-SURFACE TEMPERATURES

By GILES SLOCUM

STRAITS OF FLORIDA AND CARIBBEAN SEA

The temperatures herein published are the means of the average temperatures for the four quarters of the month, except that, in the case of the 5° subdivisions of the Caribbean Sea, the figures shown are the simple means of the observed temperatures with the entire month taken as a unit. Table 1 shows the lengths of the quarters for each length of month.

Table 2 shows the average temperature for the Caribbean Sea and the Straits of Florida for March of each year from 1919 to 1930, inclusive, and Table 3 summarizes the temperature for the month in the same areas, including the departures of the March, 1930, means from the 11-year means for March (1920-1930), and the changes from the temperatures for the preceding month of February, 1930.

The chart shows the number of observations taken during the month of March, 1930, within each 1° square; the mean temperature of the Straits of Florida, and of each 5°¹ subdivision of the Caribbean Sea: The 11-year means (1920-1930) for these areas; and the local mean time corresponding to Greenwich mean noon, at which time the mariners are instructed to make the temperature readings.

March normally brings the turn of the season in the temperature of the surface water in the Caribbean Sea and the Straits of Florida, the first quarter showing, in both bodies of water, the lowest average temperatures of any winter quarter-month, the means for the 11 years in this quarter-month being 78.2° in the Caribbean Sea and 73.9° in the Straits of Florida.

The temperature rises noticeably during the last days of March. This effect has, in the majority of years for which observations are available, made March warmer than February, more than compensating for the downward trend of the average temperature, which persists until some days after the month begins.

The seasonal lag is thus between 70 and 80 days after the winter solstice, as compared with the 15 to 40 day lag of air temperatures along the island and continental coast lines of the region.

Reference to Table 3 will show that the temperatures rose markedly from the February values, which were close to normal, to rather high figures for March in both the Caribbean Sea and the Straits of Florida. The third quarter was, in the Caribbean, as warm as the mean for the corresponding part of April, with the abnormally high readings occurring principally within the western half of the sea and south of the twentieth parallel.

TABLE 1.—Lengths of "Quarter-months" used in computing mean sea-surface temperatures

Length of month	Days of month included in quarter			
	I	II	III	IV
28 days.....	1-7	8-14	15-21	22-28
29 days.....	1-7	8-14	15-21	22-29
30 days.....	1-7	8-15	16-22	23-30
31 days.....	1-7	8-15	16-23	24-31

¹ In three cases, as indicated on the chart, the observations for small, little traveled, and unimportant areas at the outer limits of the Caribbean Sea have been treated as parts of contiguous 5° subdivisions.